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Technical Data Sheet (TDS) - Silicon Etchant

Revision Date: 22 FEB 2026
Product Name
Silicon Etchant 硅蚀刻剂**CAS Number**: N/A (Composite industrial etching mixture)**Core Formula**: Hydrofluoric Acid + Ammonium Fluoride + Special Complexing Agent + Deionized Water**Form**: Colorless to pale yellow transparent corrosive liquid**Application Grade**: Semiconductor & Photovoltaic Grade

1. Product Overview

Silicon Etchant is a high-performance industrial grade **buffered hydrofluoric acid (BHF) composite etching reagent**, specially formulated for silicon material processing in semiconductor and photovoltaic industries. It features **controllable etching rate**, **uniform etching effect** and **low surface roughness** after treatment, and can effectively etch monocrystalline silicon, polycrystalline silicon and amorphous silicon substrates. The added special complexing agent inhibits local over-etching, improves the surface quality of silicon wafers, and the stable formula ensures no phase separation and consistent etching performance under recommended storage conditions. It is the core raw material for silicon wafer thinning, pattern etching and surface treatment in semiconductor MEMS devices, photovoltaic solar cells and silicon-based sensor production.

2. Technical Specifications (Complies with Semiconductor & Photovoltaic Industrial Standard)

Item	Specification
Appearance	Colorless to pale yellow transparent liquid, no sediment/turbidity
Etching Rate (Monocrystalline Si, 25℃)	8-15 μm/min
HF Content (active ingredient)	8.0-12.0%
Ammonium Fluoride Content	4.0-6.0%
pH Value (25℃)	1.0-2.0
Density (25℃)	1.05-1.15 g/cm³
Viscosity (25℃)	10-30 mPa·s
Metal Impurity (Fe)	≤ 5 ppm
Metal Impurity (Cu)	≤ 3 ppm
Heavy Metals (Pb)	≤ 5 ppm
Water Insoluble Matter	≤ 0.01%
Storage Stability (25℃, unopened)	12 months, no phase separation
Etching Uniformity	≤±3% (on 6-inch silicon wafer)
Surface Roughness (Ra, after etching)	≤ 0.2 μm

3. Product Advantages

1. **Controllable Etching**: Stable and adjustable etching rate, accurate control of silicon wafer thickness and pattern size.
2. **Superior Surface Quality**: No pitting or over-etching, low surface roughness after treatment, meeting semiconductor high-precision requirements.
3. **High Compatibility**: Suitable for monocrystalline/polycrystalline/amorphous silicon, compatible with conventional semiconductor cleaning processes.
4. **Stable Formula**: No phase separation or ingredient precipitation under storage/use conditions, consistent batch-to-batch performance.
5. **Easy Operation**: Ready-to-use (no additional dilution), simple post-etching cleaning, improving production efficiency.
6. **Compliant with Standards**: Meets semiconductor industry clean production requirements, low metal impurity content, no harmful organic additives.

4. Application Fields

- **Semiconductor Industry**: Monocrystalline silicon wafer etching, MEMS device pattern etching, silicon-based sensor surface treatment, semiconductor chip thinning.
- **Photovoltaic Industry**: Polycrystalline silicon solar cell texturing, photovoltaic wafer edge etching, solar cell back surface field treatment.
- **Electronic Component Production**: Silicon-based diode/transistor etching, glass-silicon bonding substrate treatment.
- **Laboratory R&D**: Silicon material surface modification, micro-nano silicon structure preparation in scientific research.

5. Usage Methods

Direct Use (No additional dilution, ready-to-use)

- **Operating Temperature**: 20-28℃ (optimal 25℃); avoid high temperature (>35℃) to prevent HF volatilization.
- **Etching Time**: 1-10 min (adjust according to target etching thickness/rate, test first for small batches).
- **Application Method**: Immerse silicon wafer in etching agent (HDPE tank) with constant stirring (50-100 rpm); use wafer holder to avoid direct manual contact.
- **Post-Etching Treatment**: Rinse the etched silicon wafer with deionized water for 3-5 min (3 times of water change) to remove residual etching agent; dry with high-purity nitrogen gas.

Key Processing Requirements

- Operate in a **corrosion-resistant and well-ventilated fume hood**; use only HDPE/PTFE tools and containers (avoid glass/metal).
- Strictly control etching temperature and time to prevent over-etching; record process parameters for traceability.
- Do not mix with strong acids, strong bases, oxidants or organic solvents during use.

6. Packaging & Storage

Packaging Specifications (All corrosion-resistant HDPE material, double-sealed)

- 500 mL HDPE plastic bottle (laboratory/R&D small-batch use)
- 25 kg HDPE plastic drum (semiconductor small-scale production)
- 200 kg HDPE plastic drum (photovoltaic industrial production)
- 1000 kg IBC tote (HDPE inner liner, bulk large-scale production)
- Custom packaging (1L/5L HDPE bottle) available for laboratory research.

Storage Conditions

- **Core Requirement**: Store in a **cool, dry, well-ventilated corrosion-resistant warehouse** at 0-30℃; relative humidity ≤60%, avoid direct sunlight and high temperature.
- Keep the container tightly sealed (double-sealed) to prevent HF volatilization and moisture absorption; store in original HDPE packaging only.
- Store separately from strong acids, strong bases, oxidants, metals, glass products and food/feed; isolation distance ≥2m.
- **Shelf Life**: 12 months (unopened, under specified storage conditions); use within 1 month after opening and reseal tightly immediately.

7. Safety & Protection

- The product contains hydrofluoric acid, is strongly corrosive, and can cause severe chemical burns to skin/eyes; **wear full set of anti-corrosion PPE** during all operations, no direct contact.
- **Mandatory PPE**: Acid-alkali resistant nitrile rubber gloves (thickness ≥0.2mm), chemical splash goggles + face shield, anti-corrosion chemical protective clothing (HDPE/PTFE), acid-alkali resistant boots, and HF-specific gas mask (in poorly ventilated areas).
- **Skin Contact**: Immediately rinse the affected area with **plenty of running water** for 15-20 minutes; remove contaminated clothing/shoes, and consult a physician immediately (apply calcium gluconate gel for first aid).

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